

**SYSTEMS AND METHODS OF BLOOD-BASED THERAPIES  
HAVING A MICROFLUIDIC MEMBRANELESS EXCHANGE DEVICE**

**Abstract of the Invention**

The present invention is directed to devices, systems and methods for removing undesirable materials from a sample fluid by contact with a second fluid. The sample fluid flows as a thin layer adjacent to, or between, concurrently flowing layers of the second fluid, without an intervening membrane. In various embodiments, a secondary separator is used to restrict the removal of desirable substances and effect the removal of undesirable substances from blood. The invention is useful in a variety of situations where a sample fluid is to be purified via a diffusion mechanism against an extractor fluid. Moreover, the invention may be used for the removal of components from a sample fluid that vary in size. When blood is the sample fluid, for example, this may include the removal of 'small' molecules, 'middle' molecules, macromolecules, macromolecular aggregates, and cells, from the blood sample to the extractor fluid.